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LCA of municipal solid waste incineration in France: from comprehensive site- specific data to Life Cycle Inventory modeling

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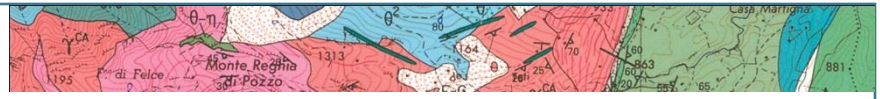

LCA of Municipal Solid Waste incineration in France: from comprehensive site-specific data to Life Cycle Inventory modelling

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Incineration in France: outlook

> Quantities treated

- **14.5 Mt of non hazardous waste** incinerated in France in 2012
- In **126 incineration plants**
- 82% were **residual Municipal Solid Waste**

> Environmental impacts

- More **constraints on emissions** ➡ decrease in emissions these last decades (dioxins: factor > 100 from 1995 to 2006; Hg: factor 7)
- **« Avoided emissions »:** varying assessments. Ex. in 2008: 1.8 Mt CO_2-eq according to French Environmental Agency, 4 Mt according to federation of professionals

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Objectives

> Of the project

- **Building a LCI model of the incineration of MSW**, in the French context

> Of this presentation

- Giving an **outlook of the model at current project status**

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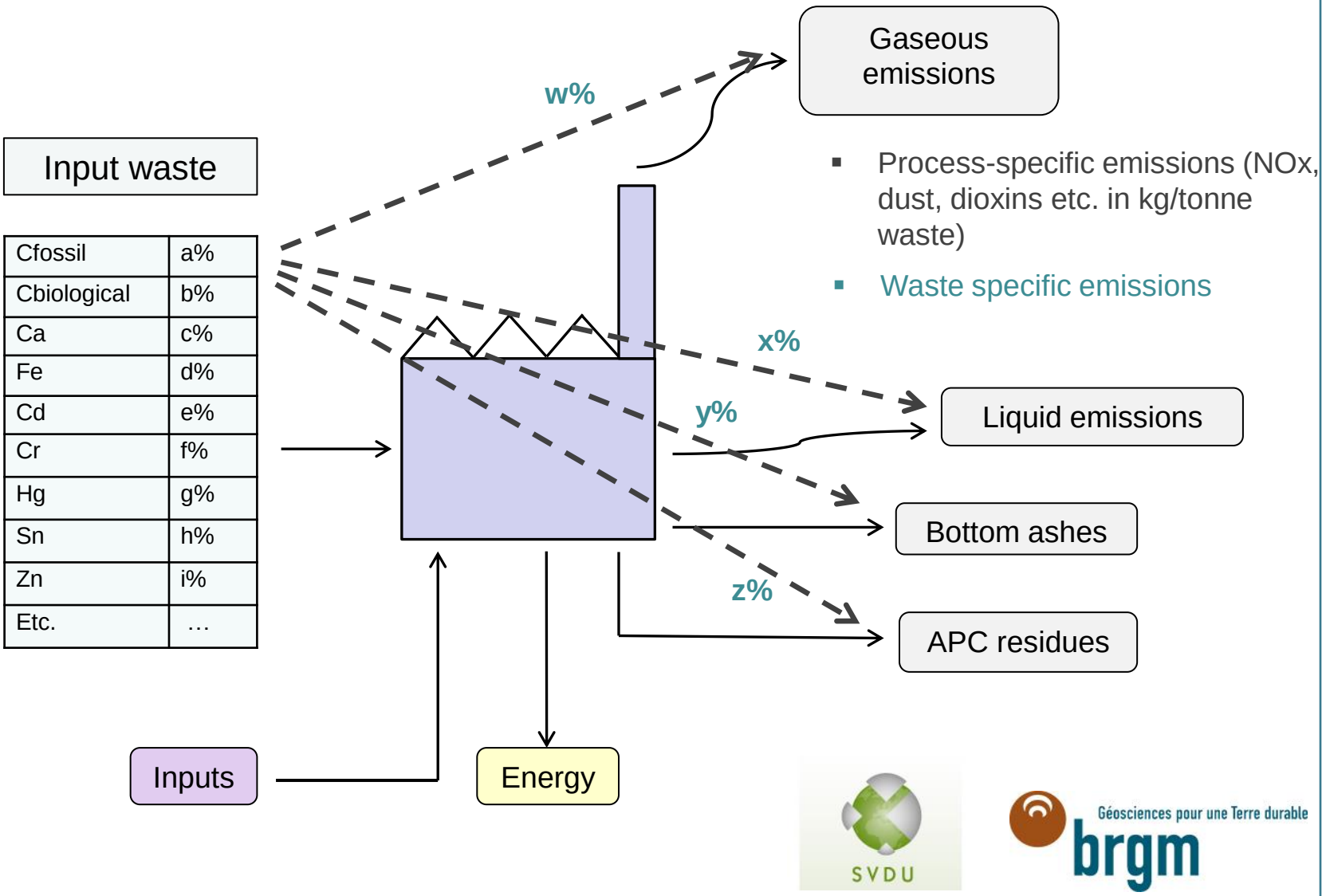
Life Cycle Inventory of waste incineration: standard model



- Process-specific emissions (NOx, dust, dioxins etc. in kg/tonne waste)
- Waste specific emissions

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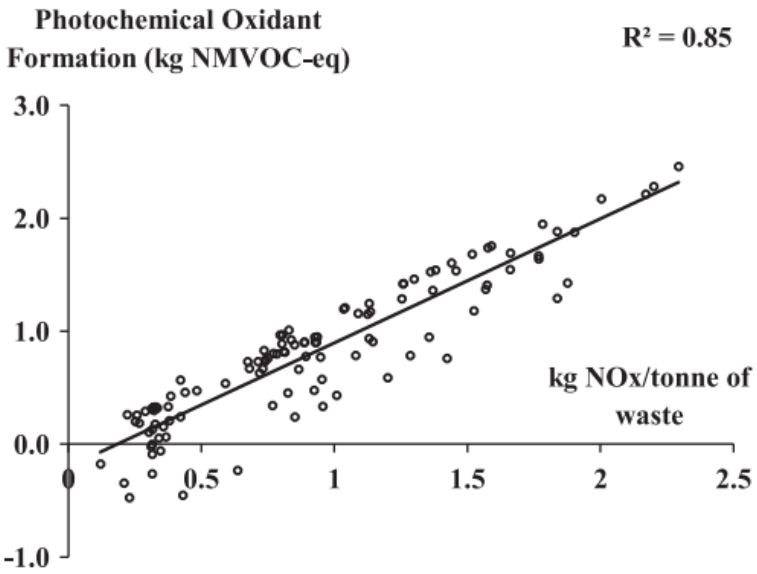
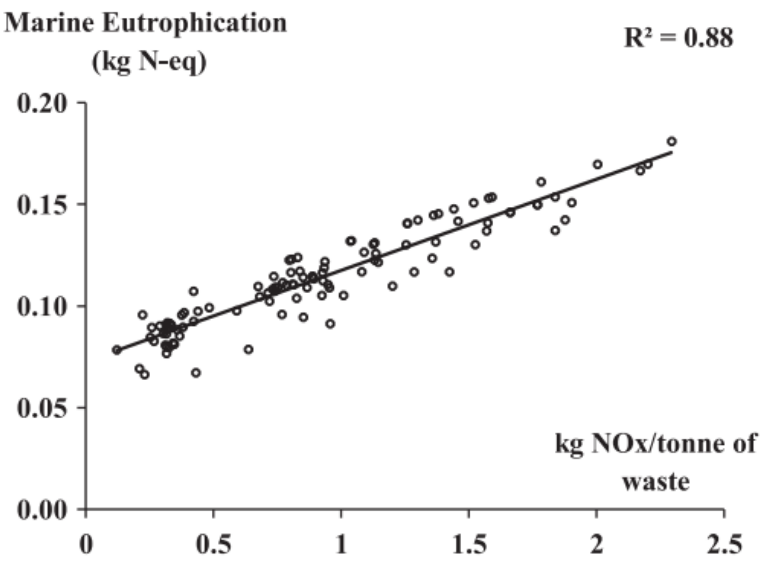
LCA of MSW incineration: preliminary results

> Comparison of 110 French incineration plants

- **Functional Unit**: incineration of 1 tonne of residual MSW
- Distinguishing their **process specific emissions** (NOx, dust, etc.) + their **energy recovery** (data 2005-2011)
- **Correlation** between non-toxic environmental impacts and plant-specific features





Beylot, A., & Villeneuve, J. (2013) *Environmental impacts of residual Municipal Solid Waste incineration: A comparison of 110 French incinerators using a life cycle approach.* Waste Management, Volume 33, Issue 12, December 2013, Pages 2781-2788

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Scheme of the developed model

Inputs

Default values:

- *Representative of the French context*
- *User-modifiable*

Waste

Mass
Composition (in fractions and elements)

Technologies of pollutant abatement

Share between technogies (%DeNOx, Dediox, etc.)
Parameters of related emissions

Energy recovery

Yield of energy recovery

Model

Outputs

Elementary flows

Gaseous emissions
Liquid emissions

Energy flows

Consumed
Recovered

Solid flows

For downstream treatment (bottom ashes and APC residues)
Consumed reagents

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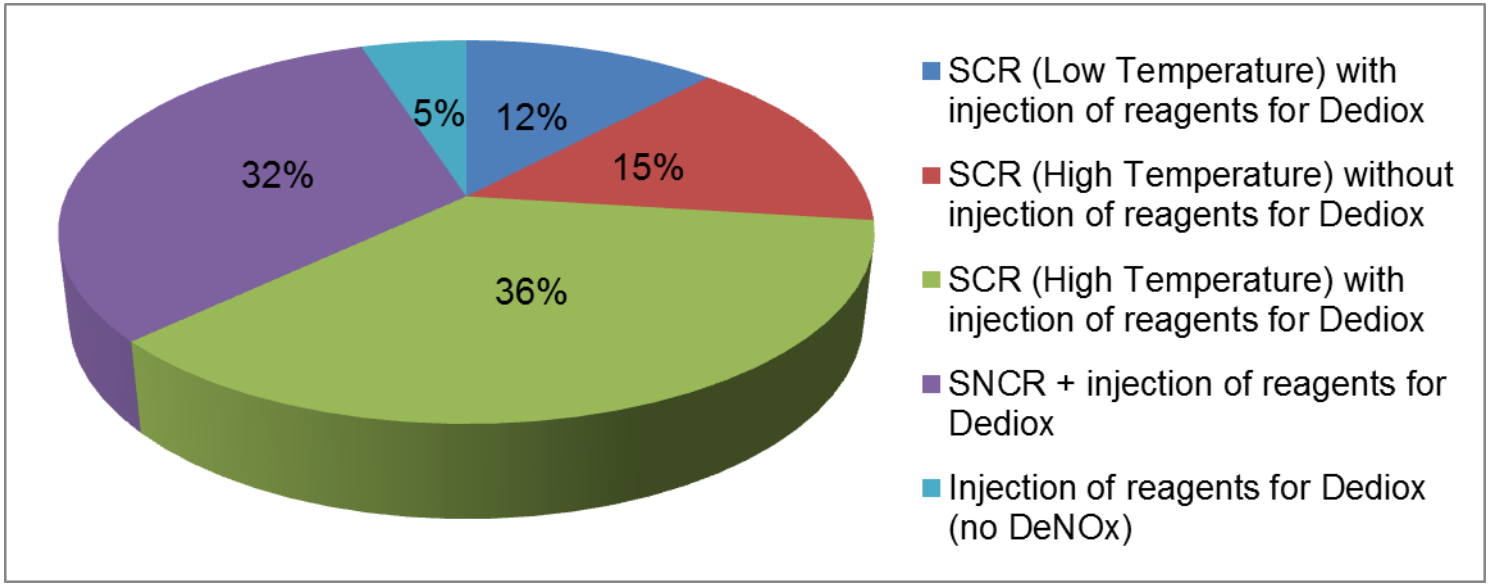
Share of APC technologies: the case of DeNOx and DeDiox

- **Data from 90 incineration plants** (73% of total MSW incinerated in France)
- **By tonne of MSW** incinerated in France in 2014



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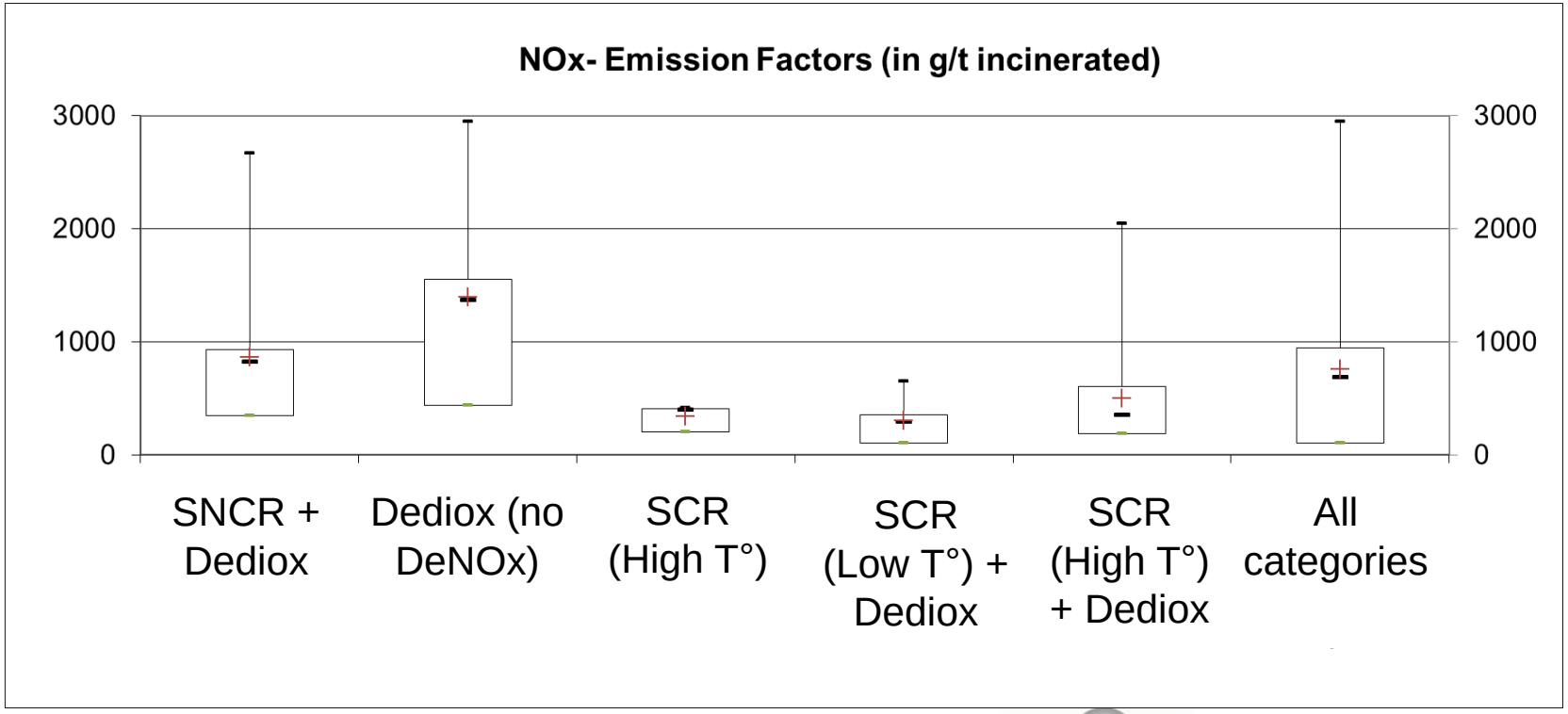
Process specific emission factors

> NOx

- Specific to each APC technology
- Data from 90 incinerators, years 2012-2014



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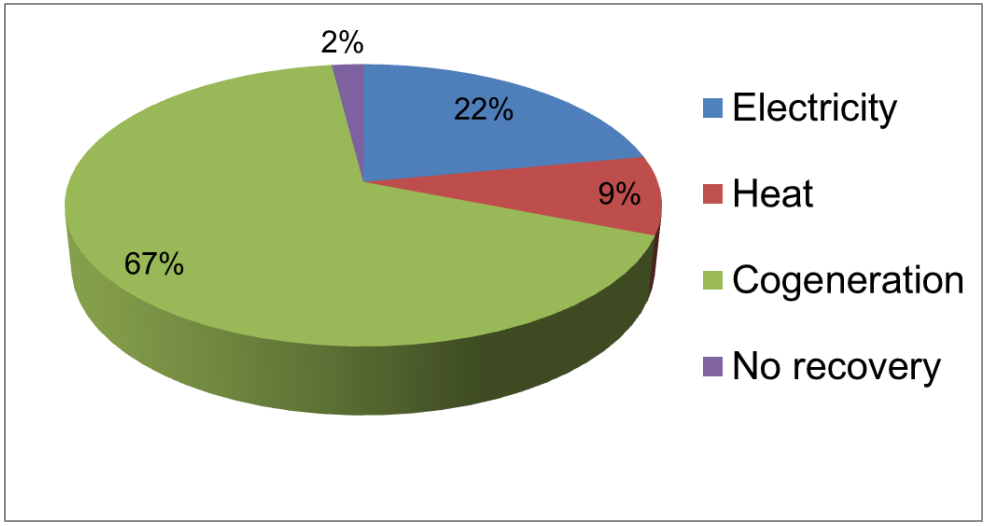
Energy recovery and delivery to the grid



- Type of energy recovery in French incineration plants (by tonne of waste treated; 100% French plants)

- Average yield of energy recovery and delivery to the network (90 French incinerators, 2012-2014)

	Electricity yield	**Heat yield**
Incineration with **electricity recovery only**	14,96%	-
Incineration with **heat recovery only**	-	41,25%
Incineration with **cogeneration (electricity + heat)**	5,73%	41,21%

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Conclusions and perspectives

> **Compilation of a large number of data** for a representative LCI modelling of waste incineration in France

> With **differentiation** of features **by APC and energy recovery technologies**

> For their integration into an **Excel tool for LCI modeling**: hopefully **available by mid-2017**

> **Data** on emissions, energy, reagents, etc., relative to 90 French incinerators for the years 2012-2014, **available for:**

- integration in **LCA databases/software tools**
- use in **scientific studies** (e.g. uncertainty accounting)

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Thank you for your attention

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References

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